

Applying UrbanSim to the Greater Paris Region in the context of the SustainCity project

Preliminary results of the first run

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ETH, Zurich, May 17th, 2010

Outline

- Presentation
- Geographical units of analysis
- Data
- Implementation in UrbanSim
- First run
- Conclusion

The Île-de-France Urban Area Simulation

- Calibration
 - From 1990 to 1999
- Simulation
 - From 1999 to 2030

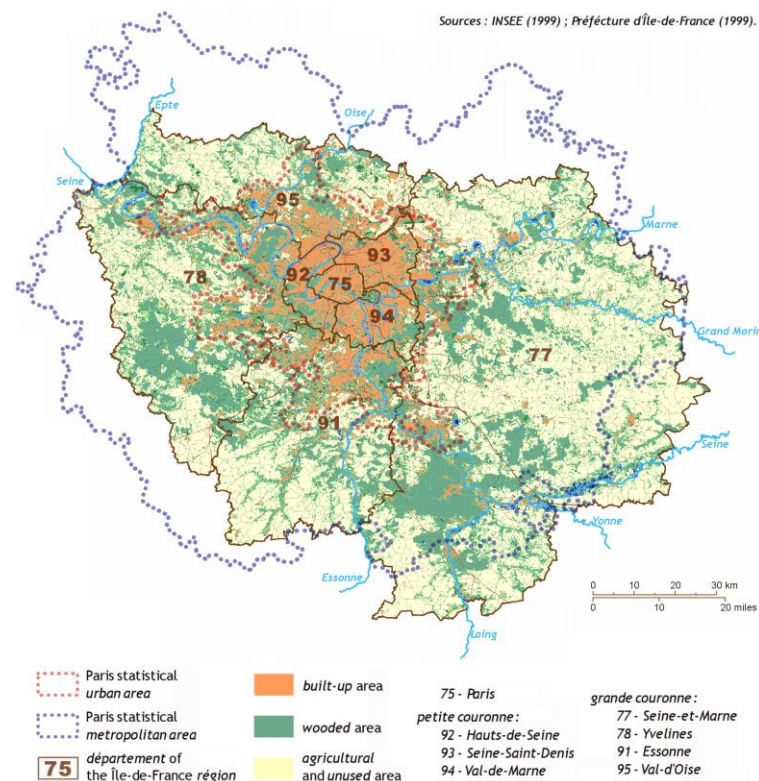
Île-de-France Urban Area First Simulation

- **KEY Features of the first run** (in 1999)
 - 12 000 km²
 - 11 millions inhabitants
(2 millions in Paris)
 - 4.5 millions households
 - 5 millions jobs
 - 4.9 millions housings

Île-de-France Urban Area First Simulation

- **KEY Features of the first run** (in 1999)
 - 2000 km Highways and Freeways
 - 1380 km Railway & Light rail network, 890 stations
 - 35 160 000 trips/day ; +1%/Year
 - Modes share :
 - 20% Public Transport,
 - 44% Private Cars
 - 36% Walk and bikes

GUA (Geographical units of analysis)



GUA

administrative point of view

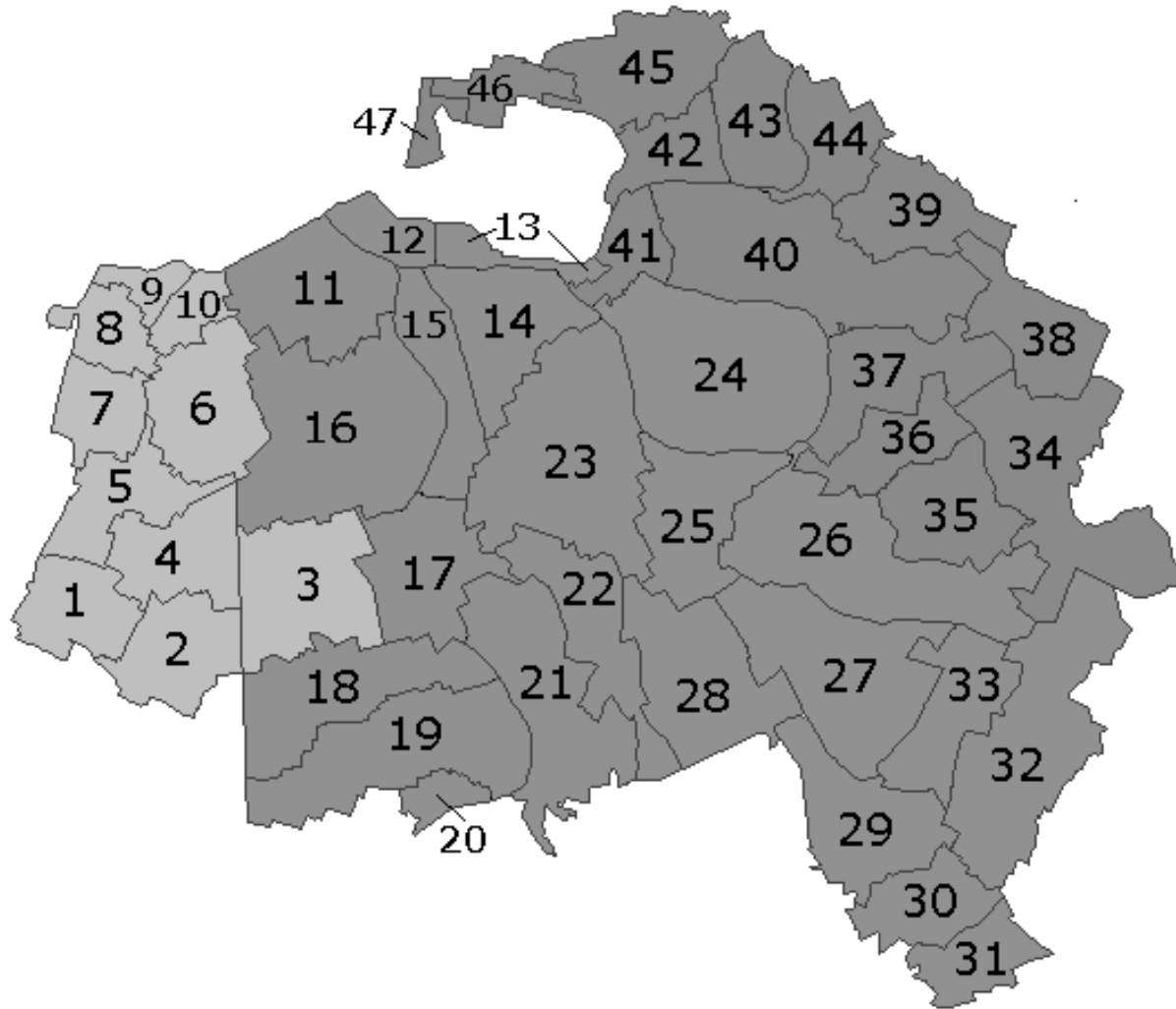
- The Île-de-France (region) composed of Paris and two *rings* which are *big ring* (*grande couronne*) and *small ring* (*petite couronne*).
- Inside each ring we have sub-divisions named *county* (*Département*).

GUA

administrative point of view

- The departments are also divided into smaller parts named *commune*.
- A commune is the lowest level of administrative division in the French Republic.
- As an example the department no. 94, Val-de-Marne, is shown in figure 2 by its commune.

County (département) no. 94



GUA

point of view with respect to census

- Institut National de la **Statistique** et des **Études Économiques** (INSEE) is the French National Institute for Statistics and Economic Studies.
- The INSEE defined two smaller GUAs as:
 - **Îlots**
 - The Îlots is the basic geographic unit for statistics and dissemination of population census held at **1999**.

GUA

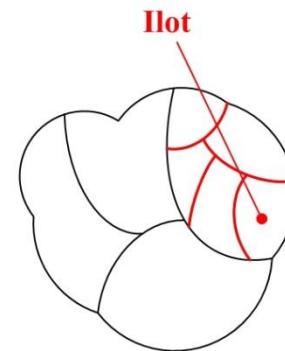
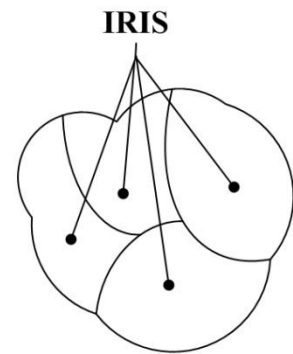
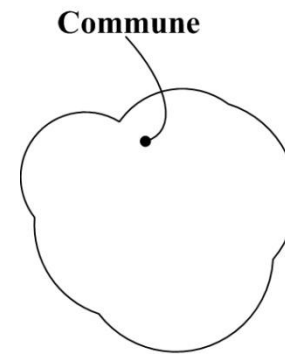
point of view with respect to census

– *IRIS*

- The name IRIS (Îlots regroupés pour l'information statistique) has been given by INSEE the basic unit of analysis for the dissemination of local data in the census of **2006** and the use of Îlots was abandoned. This means that, today, the block (unit of analysis) for the dissemination of the new census, which began from 2006, is a new unit of analysis named IRIS which has made of the combination of some Îlots.
- So, the Îlots block is not going to be used

GUA

- For Île-de-France Urban Area Simulation:
 - The GUA for the **first** run is commune
 - The GUA for the **second** run is ilot INSEE



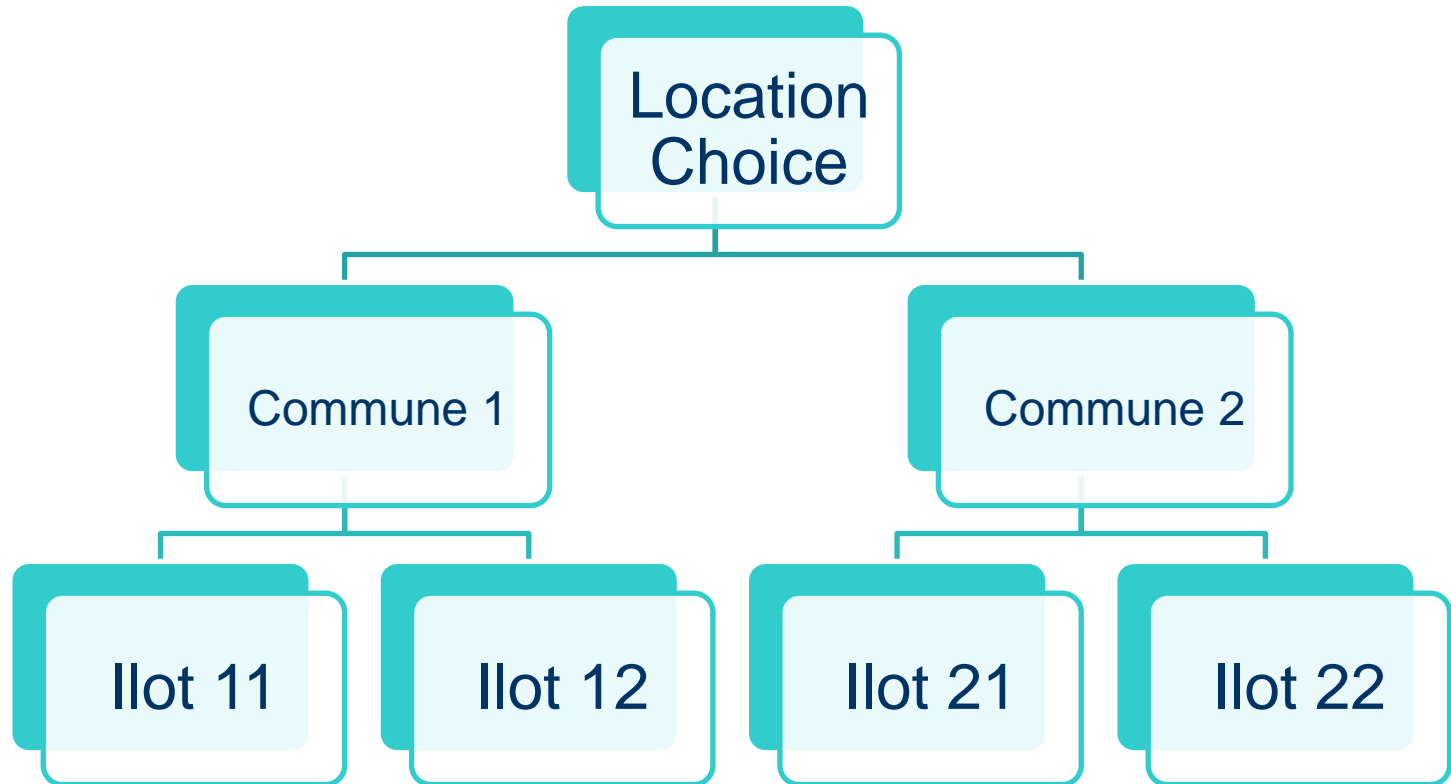
Data for the first Run (1990-1999)

- General Census (RGP) (1990 & 1999)
- Regional Transportation Survey (EGT) (1976, 1983, 1991 & 2001)
- Regional Employment Survey (ERE) (1997 & 2001)
- EVOLUMOS : numerical land use database (1982, 1990, 1994 & 1999) – but not cadastre, no floor space.
- Family Budget Survey (2000)
- Cote Callon : Real-state price (by communes)

Implementation in UrbanSim

- UrbanSim Zone version
- First run: Zone = Commune
- Second run: Zone = Ilot
- Final set: Nested implementation
 - First level: Commune
 - Second level: Ilot(Verification of the IIA)

Nested implementation



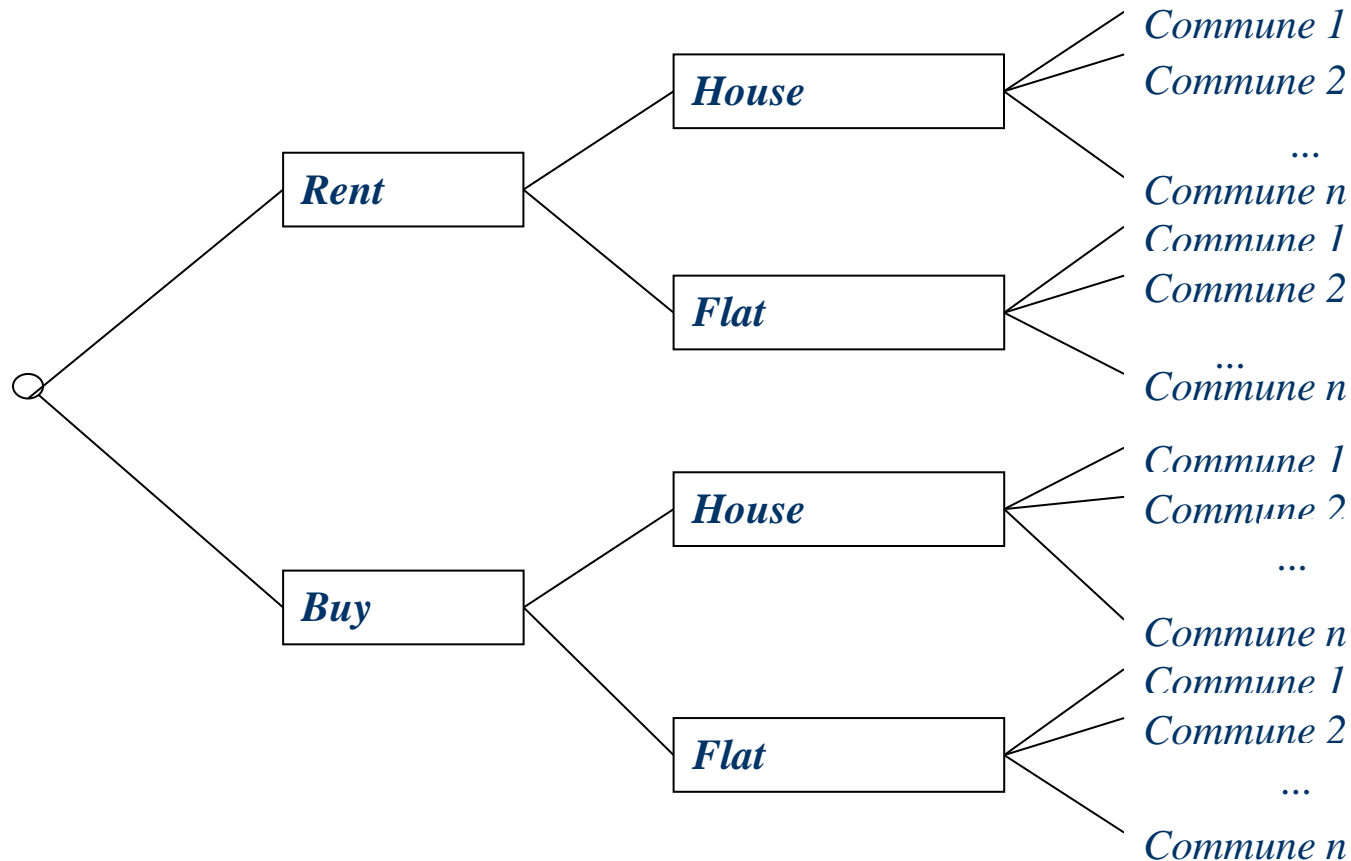
Estimation

Real-Estate Price Model

- Five Equations:
 - Rent : House (1) / Flat (2)
 - Buy: House (3) / Flat (4)
 - Office (5)

Estimation

Household Location Choice Model



Estimation

Job/Business Location Choice Model

- Job Location Choice Model (First run)
 - Business Location Choice Model (Firmography)
- (Presentation of 16:30 this afternoon)

Estimation

Development project Location Choice Model

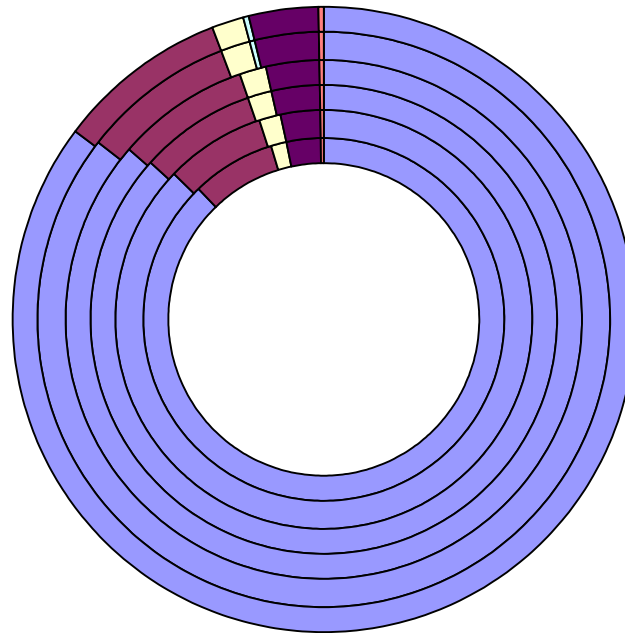
- Five types
 - Industrial
 - Commercial
 - Governmental
 - Other activities
 - Residential

% of land-use by type

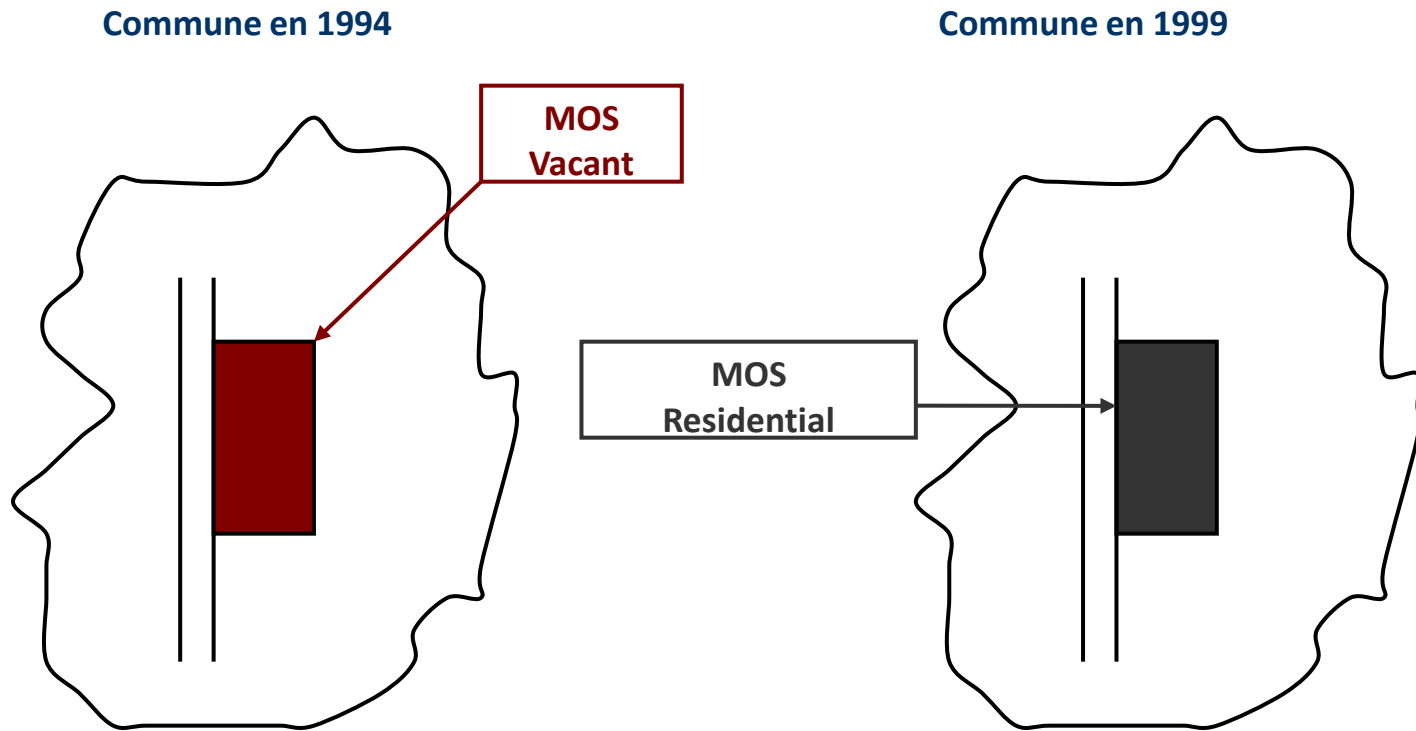
%	Vacant	Residential	Industrial	Commercial	Governmental	Other Activity
1982	87.74	7.47	1.44	0.07	2.95	0.33
1987	87.19	7.90	1.52	0.08	2.97	0.34
1990	86.68	8.05	1.58	0.09	3.24	0.36
1994	86.31	8.30	1.67	0.10	3.25	0.37
1999	85.50	8.67	1.80	0.11	3.54	0.39
2003	85.26	8.82	1.86	0.12	3.53	0.40

Land-use in Paris area

Evolution en anneaux concentriques de la répartition de la surface du Mos(6) sur l'Île-de-France entre 1982 et 2003

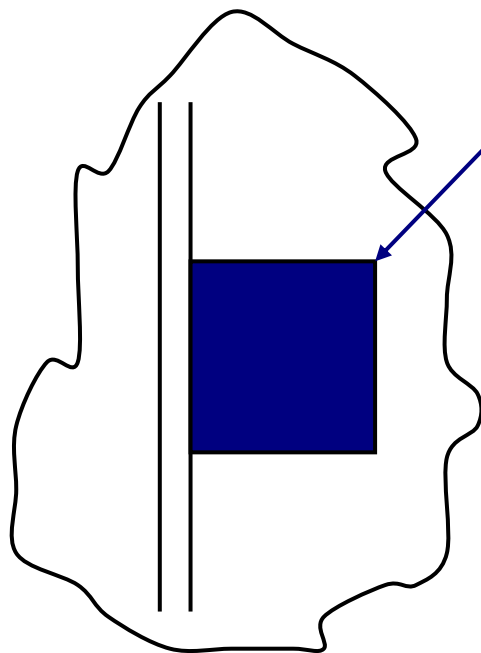


Project identification (Creation)



Project identification (Change)

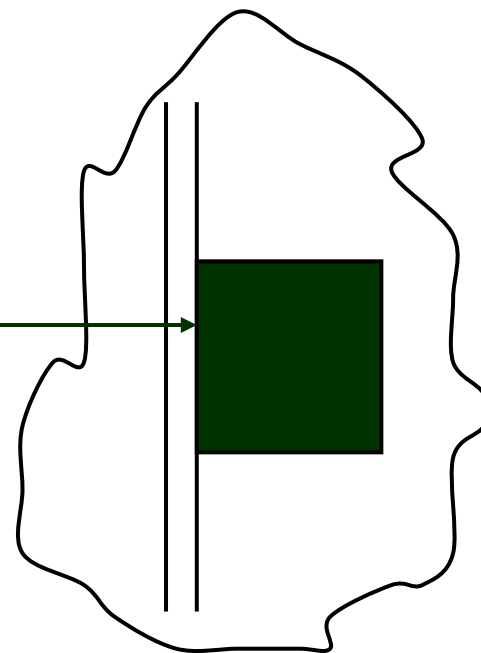
Commune en 1994



MOS
Industrial

MOS
Commercial

Commune en 1999



First run

- Estimations
 - Real-Estate Price
 - HLCM
 - ELCM
 - PLCM
- Simulations
 - First results (1990-1994)

Estimation (First run)

Real-Estate Price Model (First run)

- One Equation: Average price of houses and flats by commune.

Estimation (First run)

Real-Estate Price Model (First run)

Variable	Estimate	Probt
Intercept	10.41477	<.0001
% ZEP	-0.02632	0.264
% Water	0.07711	0.5836
% Forest	-0.00831	0.8522
% administration	0.44493	0.0971
% Young head hh	0.94198	0.0035
% Rich hh	0.27009	0.2416
% Poor hh	-1.27827	0.0047
% hh with 2 persons	-1.56569	0.0019
% hh with 3 persons or more	-0.39875	0.2432
% hh with head minority	0.46896	0.0675
Density population	0.00259	0.1776
# Train stations	0.0000693	0.9841
# Subway stations	0.00271	0.3032

Estimation (First run)

household Location Choice Model (First run)

- Location at the commune level
- One type of housing

Estimation (First run)

household Location Choice Model (First run)

Variable	Estimate	ProbChi
log(Supply)	0.7959	<.0001
Log(Dwelling price)	-0.6315	<.0001
Paris	-0.3835	<.0001
Small ring	-0.1488	<.0001
% hh with 0 workers x hh with 0 workers	4.0625	<.0001
% hh with 2 persons x hh with 2 persons	0.384	0.1147
% hh with young head x hh with young head	3.8812	<.0001
% hh with head minority x hh with head minority	5.3515	<.0001
% rich hh x rich hh	3.1803	<.0001
Same county as befor move	2.8095	<.0001
% Water	-0.6845	<.0001
% Administration	-0.8323	<.0001
density population	0.005347	<.0001
# Train stations	0.0165	<.0001
# Subway stations	0.0222	<.0001
accessibility to work by car	0.0242	<.0001

Estimation (First run)

Employment Location Choice Model (First run)

- Two sectors:
 - Industrial job location choice
 - Commercial job location choice

Estimation (First run)

Employment Location Choice Model (Commercial)

coefficient_name	estimate	p_value
# of tertiary jobs	0.0018	0
# of total jobs	-0.0017	0
population	4.813e-005	1.19e-007
# of train stations	0.3209	8.82e-006
density population	0.1828	3.57e-007

Adj. likelihood ratio index: 0.80 (To be checked more in detail)

Estimation (First run)

Development project Location Choice Model (Industrial)
(At Îlot, Adj. likelihood ratio index: 0.353)

COEFFICIENT_NAME	ESTIMATE	T_STATISTIC
commercial_sqft_within_walking_distance	1.64E-05	5.7681
distance_to_chatelet	1.43E-05	10.1794
is_in_inner_ring	-0.1046	-2.3198
land_vacant	7.89E-06	11.4540
industrial_improvement_value	3.18E-07	90.8507
ln_office_price	-0.5007	-6.0173
number_of_mid_income_households	-0.0073	-6.3914
number_of_households	0.0017	2.4394
# of_households_within_walking_distance	1.96E-05	3.3660
number_of_minority_households	-0.0020	-2.1629
number_young_head_households	-0.0048	-6.2349
zone.is_in_paris	-4.5557	-7.6662
percent_old_head_households	-0.0164	-17.2165

Estimation (First run)

Development project Location Choice Model (Commercial)
(At Îlot, Adj. likelihood ratio index: 0.508)

COEFFICIENT_NAME	ESTIMATE	T_STATISTIC
commercial_improvement_value	4.14E-06	61.5212
commercial_sqft_within_walking_distance	2.95E-05	3.7050
distance_to_chatelet	1.61E-05	4.1893
distance_arterial	-5.90E-05	-2.3146
distance_highway	-2.75E-05	-2.2822
is_in_inner_ring	-0.5248	-4.3849
land_vacant	7.00E-06	3.8023
ln_office_price	-0.5465	-2.3717
ln_population	0.1118	4.1957
number_of_households_with_0_cars	-0.0058	-3.8845
number_old_head_households	0.0076	6.7917
is_in_paris	-5.4572	-3.3118
percent_old_head_households	-0.0193	-7.7152
percent_young_head_households	0.0063	2.2683

Estimation (First run)

Development project Location Choice Model (Residential)
(At Îlot, Adj. likelihood ratio index: 0.579)

COEFFICIENT_NAME	ESTIMATE	T_STATISTIC
distance_to_chatelet	3.17E-05	45.2552
distance_arterial	4.65E-05	13.9992
distance_highway	1.84E-05	10.8169
is_in_inner_ring	-0.3191	-14.8007
land_vacant	6.00E-06	15.8009
ln_dwelling_price	0.4923	16.0999
ln_population	0.8215	102.8276
number_of_households	-0.0013	-3.4482
number_of_households_with_0_cars	-0.0026	-11.3885
number_of_households_with_1_cars	-0.0065	-21.4163
number_of_households_within_walking_distance	3.66E-05	15.1078
is_in_paris	-0.8863	-14.1249

Simulations (First run)

- UrbanSim version 4.3
- Two models: HLCCM and Real-Estate Price
- From 1990 to 1994
- Couldn't run under a Win32 with 4 Gb RAM
- We used a computer with OS Linux 64bit and 8 Gb RAM
- Time of run ~20 mns for 4 years

First results

	Paris	1990	1994	Difference	%
# Households	Paris	1077620	1322239	244619	22.70%
	Outside Paris	3171952	3183722	11770	0.37%
Population	Paris	2014888	2769651	754763	37.46%
	Outside Paris	8048180	7936688	-111492	-1.39%

Comparison Simulated - Observed

1994	Paris	Simul	Obser	Difference	%
Population	Paris	2.77	2.13	639795	30%
	Small Ring	4.08	4.01	65596	2%
	Big Ring	3.86	4,69	-832275	-18%

Thanks for your attention